

DRAFT

2014-17 Strategic Plan

University of Wisconsin Sea Grant College Program

INTRODUCTION

In this millennium, freshwater has been termed the new oil, offering the global community a vital natural resource that, literally, sustains life and drives commerce, manufacturing, recreational opportunities and cultural wealth. With the world's largest freshwater system at its borders, Wisconsin, and in fact all states in the Great Lakes region, are located alongside a commodity as priceless as any Middle-Eastern oil field. The freshwater system contains six quadrillion gallons (> 193.5 trillion barrels) of water, touches the lives of a tenth of the U.S. population who reside and work along the sweetwater seas' shores and supports one of the largest regional economies on the planet; including a \$7 billion fishery and a \$16 billion tourism industry. A 2011 analysis by the University of Michigan concludes that the Great Lakes generate \$62 billion in wages each year and that more than 1.5 million jobs are directly connected to the waterways.

Given these freshwater assets, 2014-17 will mark a time of promise. Equally, it will mark a time of pressure. A shifting economy, a changing climate, coastal hazards, the demands to clean up polluted waters and coastlines, the march of aquatic invasive species and an imperative to educate stakeholders of all types about the sustainable use of the Great Lakes crowd to take front and center of the region's time, energy and funding.

Wisconsin Sea Grant is ideally positioned to respond to the needs. As its mission statement reads: ***"UW Sea Grant supports scientific research, education and outreach to foster the wise use, conservation and sustainable development of Great Lakes and coastal resources."***

In all instances, Wisconsin Sea Grant strives to provide unbiased information to Great Lakes coastal residents, resource managers and other stakeholders. As stewards of one of the world's greatest natural resources, the program lives this mission every single day. This strategic plan lays out a path to realize fully and collaboratively that stewardship from a science-based perspective. Importantly, it also relies on Wisconsin Sea Grant's ability respond to unexpected issues. While the program has laid out initiatives and activities, it is also adept at being nimble and poised to respond rapidly and effectively to needs that arise with little or no warning.

ABOUT SEA GRANT

The hallmark of the National Sea Grant College Program is its ability to fund cutting-edge research at the nation's leading academic institutions. More than 375 Sea Grant outreach and education specialists share that research with businesses, educators, policymakers, communities and citizens to enhance the practical use and conservation of Great Lakes, ocean

and coastal resources to create a sustainable economy and environment. Created in 1966, the National Sea Grant College Program today supports a national network composed of 33 university-based state programs, a national law center, a national library, and hundreds of participating institutions and public- and private-sector partners. More than 3,000 university scientists, outreach specialists, educators and students participate in the program each year. Administered by the National Sea Grant Office of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, Sea Grant's university-based programs are fundamental to the development of tomorrow's aquatic resources scientists and managers. Sea Grant thus provides integrated research, outreach and education programs that provide tangible benefits for ocean, coastal and Great Lakes environments and the communities they support.

Established in 1968, the University of Wisconsin Sea Grant College Program is one of the oldest and largest programs in both the national and Great Lakes Sea Grant networks. UW Sea Grant's highly diversified research agenda has made it a national leader on the topics of toxic contaminants, water quality, fisheries management and ecosystem dynamics. As an unbiased, non-advocate source of science-based information, through our outreach and communications programs Sea Grant reaches across Wisconsin and the Great Lakes basin, building bridges and fostering partnerships for sustainable use of Great Lakes resources.

SEA GRANT VISION, MISSION AND VALUES

The National Sea Grant College Program envisions a future in which people live along our coasts in harmony with and understand the environment and natural resources that attracted and sustain them. This is a vision of a coastal America that uses these natural resources in ways that capture the environmental, economic and recreational benefits they offer while preserving their quality and abundance for future generations. This vision reinforces the vision articulated in NOAA's Next Generation Strategic Plan "NOAA's mission of science, service, and stewardship is directed to a vision of the future where societies and their ecosystems are healthy and resilient in the face of sudden or prolonged change."

Sea Grant advances NOAA's mission "to understand and predict changes in Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social and environmental needs."

The program's core values integrate research with constituent engagement. It was a pioneer in translation of research (from discovery to application) and ensures that unbiased, science-based information is available to all.

STRATEGIC IMPLEMENTATION

Wisconsin Sea Grant's 2014-17 Strategic Plan is structured in accordance with the National Sea Grant College Program's 2014-17 Strategic Plan, which capitalizes on Sea Grant's unique capacities and strengths, allows for flexibility and creativity on the part of state Sea Grant

programs, and supports many of NOAA's strategic priorities, such as promoting the health of coastal ecosystems, increasing the accessibility and application of quality relevant research to support wise decision-making, increasing the number of fish stocks managed at sustainable levels, and expanding literacy about coastal ecosystems.

The NOAA National Sea Grant College Program 2014-17 Strategic Plan provides an overarching guide for the work of the state Sea Grant programs. Each university program then develops its own strategic plan for contributing to the realization of national goals, while reflecting the specific needs and priorities of its state and region. For Wisconsin, state needs are broadly identified through a general situation analysis and needs assessment (**Appendix 1**), while specific needs are based on the regional research and information priorities that were identified by the Great Lakes Regional Research Information Network (**Appendix 2**) and the Great Lakes Regional Collaboration, Council of Great Lakes Governors and Wisconsin's Coastal Management Program, Department of Natural Resources and Department of Agriculture, Trade and Consumer Protection, which resulted in the Great Lakes Restoration Initiative (GLRI <http://greatlakesrestoration.us/priorities.html>).

The Wisconsin Sea Grant strategic plan also incorporates the institutional goals and priorities of the University of Wisconsin-Madison's priorities and initiatives (**Appendix 3**). By combining the strategic goals and [4] priorities of the national Sea Grant network with those of our parent institution, our strategic plan thus provides a highly relevant basic blueprint for UW Sea Grant research, outreach, education and program administration.

Built on this foundation, our strategic planning approach is a bottom-up process in which our program priorities undergo review and updates every two years in connection with preparing our biennial request for proposals, and the entire plan is reviewed and updated every four years in connection with developing the program's core advisory services, communications and education work plans for the next four years (see **Appendix 4** for details).

University of Wisconsin Sea Grant's 2014-17 Strategic Plan thus presents a research, outreach and education agenda that carefully integrates and responds to clearly identified learning, action and consequence outcomes at the local, state, regional and national levels. Based on this plan, the research, education and outreach projects funded by the UW Sea Grant College Program through its highly competitive grants process will help provide the scientific knowledge necessary for addressing a wide range of Great Lakes resource issues.

Wisconsin Sea Grant's strategic plan builds upon the National Sea Grant strategic plan that has four focus areas with a total of 11 goals and 12 goal-specific performance measures. The national plan also lists two cross-cutting performance measures that apply to all four focus areas. These goals and focus areas reflect America's most urgent needs in the coastal, ocean and Great Lakes arenas, NOAA priorities, and Sea Grant's strengths and core values. As part of the national implementation plan, university programs also identify quantitative performance measures in each area as part of their state-level implementation plans. Our Wisconsin plan

expands the list of performance measures and offers strategies to achieve the goals. The National Sea Grant program offers this strategic approach to managing coastal resources in ways that balance human use with environmental health:

- Better science-based information about how coastal ecosystems function and how human activities affect coastal habitats and living resources;
- Citizens who understand the complexities of coastal environments and the interactions between human use and coastal ecosystem health;
- Management and decision-making processes that are based on sound information, involve citizens who have a stake in America's coastal resources and include mechanisms to evaluate trade-offs between human and environmental needs; and,
- Incorporation of social science, including quality of life and sustainable economic development, into ecosystem-based management decisions.

Further, the National Sea Grant College Program strategic plan identifies four focus areas all of which are generally applicable to Wisconsin:

- Healthy Coastal Ecosystems
- Sustainable Fisheries and Aquaculture
- Resilient Communities and Economies
- Environmental Literacy and Workforce Development

Focus Area: Healthy Great Lakes Coastal Ecosystems (HCE)

Fifteen of Wisconsin's 72 counties border the Great Lakes of Superior and Michigan totaling over 800 miles of shoreline. On Lake Michigan, these ecosystems span from the state's southern border with Illinois north to the shared border with Michigan's Upper Peninsula. Wisconsin's Lake Superior habitats extend west from our shared border with Michigan's Upper Peninsula to the diverse ecosystem comprising the St. Louis Estuary at Superior. In Wisconsin, our healthy coastal ecosystems, sustained by their surrounding watersheds, are the foundation of life along the coast.

Keeping coastal ecosystems healthy is a challenge because of the diversity of stressors each system faces. This is further complicated because ecosystems do not adhere to political boundaries. Responsible management of these systems requires new kinds of thinking and actions, often termed ecosystem-based management¹. Ecosystem-based approaches require unprecedented levels of coordination among federal, state and local jurisdictions and the active engagement of the people who live, work and play along our coasts. They also require

¹ Ecosystem-based management is an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors.

understanding of the characteristics of species, landscapes and their interactions within each ecosystem.

In general, increasingly rapid coastal development, greater demands on fisheries resources, climate change and other human activities are leading to water-quality degradation, increased demands on water supplies, changes to fisheries stocks, wetlands loss, proliferation of aquatic invasive species and a host of other environmental impacts. It is essential for decision-makers and Great Lakes coastal residents to understand the interconnectedness and interactions of these systems in order to maintain vital habitats and inform restoration efforts within ecosystems and watersheds.

Sea Grant is a leader in regional approaches to understanding and maintaining healthy ecosystems, with planning efforts across the country to identify information gaps, implement research priorities and coordinate information and technology transfer to people who need it. Sea Grant recognizes the need to determine the value of myriad ecosystem² services that provide that maintain the conditions for life in and along the Great Lakes. Wisconsin Sea Grant and our partners are well-suited to clarifying and addressing ecosystem health at the appropriate management level.

1. Goal: Ecosystem services are improved by enhanced health, diversity and abundance of fish, wildlife and plants.

Learning Outcomes

- 1.1. Develop and calibrate new standards, measures and indicators of Great Lakes ecosystem sustainability.
- 1.2. Identify critical uncertainties that impede progress toward achieving sustainability of Great Lakes ecosystems and the goods and services they provide.

Action Outcomes

- 1.3. Wisconsin and Great Lakes resource managers, policy- and decision-makers use standards and indicators to support ecosystem-based management.

Consequence Outcomes

- 1.4. Dynamic ecological systems provide a wide range of ecological, economic and societal services and are more resilient to adverse changes.
- 1.5. Greater public stewardship in the Great lakes region leads to participatory decision-making and collaborative ecosystem-based management decisions.

Wisconsin Sea Grant's Goal 1 Strategies

- HCE-1. Support research that seeks to develop and calibrate measures and indicators of Great Lakes ecosystem health.

² Ecosystem services include provisioning (food and water), regulating (flood and disease control), cultural (spiritual, recreational and cultural benefits) and supporting (nutrient cycling).

- HCE-2. Support research that will help identify factors that threaten the sustainability of Great Lakes ecosystems and the services they provide.
- HCE-3. Engage researchers with the Sea Grant staff to effectively make available and deliver useful ecosystem standards and indicators to resource managers, policy- and decision-makers.
- HCE-4. Establish baseline assessment of collaborative public stewardship and decision-making activities such that improvements can be measured.

2. Goal: Ecosystem-based approaches are used to manage land, water and living resources.

Learning Outcomes

- 2.1. Great Lakes stakeholders have access to data, models, policy information and training that support ecosystem-based planning, decision-making and management approaches.
- 2.2. Baseline data, standards, methodologies and indicators are developed to assess the health of Great Lakes and watershed-related ecosystems.
- 2.3. Residents, resource managers, businesses and industries understand the effects of human activities and environmental changes on coastal resources.
- 2.4. Resource managers have an understanding of the policies that apply to coastal protected species.

Action Outcomes

- 2.5. Methodologies are used to evaluate a range of practical ecosystem-based management approaches for planning and adapt to future management needs in the Great Lakes region.
- 2.6. Resource managers apply ecosystem-based management principles when making decisions.
- 2.7. Resource managers incorporate laws and policies to facilitate and implement ecosystem-based management.
- 2.8. Residents, resource managers and businesses integrate social, natural and physical science when managing resources and work with all sectors in the decision-making process.

Consequence Outcomes

- 2.9. Land, water and living resources in the Great lakes region are managed using ecosystem-based approaches.

Wisconsin Sea Grant's Goal 2 Strategies

- HCE-5. Improve and enhance stakeholder access to and understanding of data, models, policy information and training in Wisconsin and the Great Lakes that support ecosystem-based planning, decision-making and management approaches.

HCE-6. Develop and share materials, websites, training and workshops to help residents, resource managers, businesses and industries understand the effects of human activities and environmental changes on coastal resources.

HCE-7. Provide residents, resource managers and businesses in the Great Lakes region with materials and training so that they understand and apply the policies that apply to coastal protected species and habitats.

HCE-8. Collaborate with local, state, tribal and regional agencies and non-governmental organizations to implement strategies.

3. Goal: Ecosystems and their habitats are protected³, enhanced or restored.

Learning Outcomes

- 3.1. Great Lakes residents, resource managers and businesses understand the importance of the benefits provided by preserving non-degraded ecosystems.
- 3.2. Residents, resource managers and businesses understand the threats to ecosystems and the consequences of degraded ecosystems.
- 3.3. Scientists develop technologies and approaches to restore degraded ecosystems.

Action Outcomes

- 3.4. Resource managers set realistic and prioritized goals to protect, enhance and restore habitats by incorporating scientific information and public input.
- 3.5. Resource managers, businesses and residents adopt innovative approaches and technologies to maintain or improve the function of ecosystems.

Consequence Outcomes

- 3.6. Habitats are protected, enhanced or restored in the Great Lakes region.
- 3.7. Degraded ecosystem function and productivity are restored.

Wisconsin Sea Grant's Goal 3 Strategies

HCE-9. Provide interpretation of data, training and materials to help residents, resource managers and businesses understand the threats to Great Lakes ecosystems and importance of the benefits provided by preserving non-degraded ecosystems.

HCE-10. Support research that seeks to develop technologies and approaches to restore degraded Great Lakes ecosystems.

HCE-11. Support efforts to involve stakeholders in resource management decision-making processes and to help resource managers incorporate public input in resource management decisions.

HCE-12. Work with key stakeholders to collaboratively raise awareness and help reduce the rate of introduction and spread of aquatic invasive species in the Great Lakes region.

³ In the context of this goal, protected areas are those places in some form of conservation management program.

HCE-13. Collaborate with local, state, tribal and regional agencies and non-governmental organizations to implement strategies.

National Sea Grant Healthy Coastal Ecosystems Performance Measures

HCE-npm-1. Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve Great Lakes ecosystem-based management.

HCE-npm-2. Number of ecosystem-based approaches used to manage land, water and living resources in coastal areas as a result of Sea Grant activities.

HCE-npm-3. Number of acres of Great Lakes coastal habitat protected, enhanced or restored as a result of Sea Grant activities.

Wisconsin Sea Grant Healthy Great Lakes Ecosystems Performance Measures

HCE-wpm-1. Investment in research projects that hold promise to develop measures and indicators of Great Lakes ecosystem health or that identify factors that threaten the sustainability of Great Lakes ecosystems.

HCE-wpm-2. The number of geospatial technologies applied to better understand the relationship of Great Lakes ecosystem health with stakeholder in Wisconsin coastal communities.

HCE-wpm-3. The number of ecosystem-based management tools that are used to manage Great Lakes coastal resources.

HCE-wpm-4. The number of Great Lakes ports and harbor projects that initiate the beneficial use of their harbor's navigation channel dredged material as the result of Wisconsin Sea Grant Institute research and outreach.

HCE-wpm-5. The amount of Great Lakes dredged material put to beneficial use as the result of Wisconsin Sea Grant Institute research and outreach.

HCE-wpm-6. The number of training sessions for stakeholders and key stakeholder groups on Great Lakes AIS prevention efforts.

HCE-wpm-7. The number of promotional events on how to prevent the introduction and spread of AIS and organisms in trade in the Great Lakes region.

Focus Area: Sustainable Fisheries and Aquaculture in the Great Lakes Region (SFA)⁴

The nation has witnessed the decline of many of its major fisheries while seafood consumption has increased and continues to be encouraged because of its health benefits. To fill the gap between seafood demand and domestic harvests, the United States imports 86 percent⁵ of

⁴ We use a working definition of "seafood sustainability" that is based on the NOAA Fishwatch concept. Sustainability involves "meeting today's needs without compromising the ability of future generations to meet their needs. In terms of seafood, this means catching or farming seafood responsibly, with consideration for the long-term health of the environment and the livelihoods of the people who depend upon the environment."

⁵ Food and Agriculture Organization of the United Nations, www.fao.org

what is consumed leading to a seafood trade deficit of over \$10 billion⁶ per year. With global wild fisheries harvests at a plateau of around 185 metric tonnes⁷, some 50 seafood species are now produced from aquaculture. There are no projected increases in wild capture fisheries, but global aquaculture is predicted to increase by 33 percent over the next decade. These projections create opportunities for an expanded Great Lakes basin aquaculture industry and for innovative marketing strategies and value-added products for the wild fisheries industry.

The overall economic impact of the commercial, recreational, for-hire fisheries and aquaculture industries in the region is \$7 billion annually. In Wisconsin, 1.4 million fishing licenses are issued each year, and fishers and the fishing industry deliver \$2.75 billion in economic impact and 30,000 jobs every 12 months. There are 70 commercial fishers in Wisconsin who rely on fewer than 10 species, and have a combined harvest of \$5 million annually.

Wisconsin's aquaculture industry contributes \$21 million in annual economic activity and more than 400 jobs to the state. There is definitely room for growth –additional opportunities for job creation, and contributing to meeting the demand for finfish. The Midwest consumes more than a billion pounds of seafood products per year but less than 4 percent comes from aquaculture operations in the region.

Sea Grant continues to play a leadership role in developing innovative technologies for all sectors of the seafood industry, including fishing, aquaculture, seafood processing and consumer safety, to ensure a safe and sustainable supply of seafood products now and for future generations. Seafood safety will continue to be a concern for consumers as foreign imports, some of which are associated with seafood contamination, continue to increase. Sea Grant's partnership with NOAA Fisheries, state fisheries managers, seafood processors, fishing associations, the aquaculture industry and consumer groups will ensure safe, secure and sustainable supplies of domestic seafood and decrease our reliance on seafood imports.

4. Goal: A safe, secure and sustainable supply of seafood to meet public demand.

Learning Outcomes

- 4.1. Fishery managers and fishermen in the Great Lakes understand the dynamics of wild fish populations.
- 4.2. The seafood industry⁸ is knowledgeable about innovative technologies, approaches and policies.
- 4.3. Commercial and recreational fishermen are knowledgeable about efficient and responsible fishing techniques.
- 4.4. The commercial fishing and aquaculture industries are aware of innovative marketing strategies to add value to its product.

⁶ U.S. Department of Agriculture Foreign Agricultural Service statistics

⁷ Food and Agriculture Organization of the United Nations

⁸ The seafood industry includes all sectors of the industry, including aquaculturists, fishermen, processors, wholesalers, retailers and supporting businesses.

- 4.5. The seafood processing industry learns and understands economically viable techniques and processes to ensure the production and delivery of safe and healthy seafood.

Action Outcomes

- 4.6. Great Lakes fishermen employ efficient and sustainable fishing techniques.
- 4.7. Fishermen apply techniques to reduce negative impacts on depleted, threatened or endangered species.
- 4.8. The seafood industry adopts innovative technologies and approaches to supply safe and sustainable seafood.
- 4.9. The commercial fishing and aquaculture industries adopt innovative marketing strategies to add value to their products.
- 4.10. The seafood industry adopts techniques and approaches to minimize the environmental impact of their sectors.
- 4.11. Great Lakes resource managers establish policies and regulations that achieve a better balance between economic benefit and conservation goals.
- 4.12. The seafood processing industry implements innovative techniques and processes to create new product forms and ensure the delivery of safe and healthy seafood.

Consequence Outcomes

- 4.13. The U.S. seafood⁹ supply is sustainable and safe.
- 4.14. There is an expansion of the sustainable domestic fishing and aquaculture industries.

Wisconsin Sea Grant's Goal 4 Strategies

- SFA-1. Support research that seeks to develop and improve aquaculture practices and techniques, including aquaponics, nutritional value of feeds and disease and pathogen prevention and diagnosis.
- SFA-2. Make wild fish harvesters and aquaculture operations aware of advancements in product handling, packaging and marketing strategies.
- SFA-3. Identify and develop non-traditional, more efficient approaches to wild fish harvest for use on the Great Lakes.
- SFA-4. Help the public and resource managers understand the full costs and implications of regulations on fish production operations.
- SFA-5. Collaborate with local, state, tribal and regional agencies and non-governmental organizations to implement strategies.

5. Goal: Informed consumers who understand the health benefits of seafood consumption and how to evaluate the safety and sustainability of the seafood they buy.

Learning Outcomes

- 5.1. The seafood industry is aware of the standards for safe seafood.

⁹ Seafood includes product originating from all sectors of the fishing and aquaculture industries.

- 5.2. The seafood industry is knowledgeable about consumer trends regarding seafood sustainability and safety and how to adjust operations to meet emerging demands.
- 5.3. U.S. seafood consumers have the knowledge to evaluate sustainable seafood choices.
- 5.4. U.S. seafood consumers have an increased knowledge of the nutritional benefits of seafood products and know how to judge seafood safety and quality.

Action Outcomes

- 5.5. The seafood industry adopts standards for safe seafood.
- 5.6. The seafood industry adopts technologies and techniques to ensure seafood safety.
- 5.7. U.S. seafood consumers preferentially purchase sustainable seafood products.

Consequence Outcomes

- 5.8. Consumers improve their health through increased consumption of safe and sustainable seafood products.
- 5.9. The U.S. seafood industry operates sustainably and is economically viable.

Wisconsin Sea Grant's Goal 5 Strategies

- SFA-6. Support research that develops a better understanding of the benefits and risks of Great Lakes fish consumption for various populations.
- SFA-7. Adapt Sea Grant or modify existing products or develop new consumer outreach products for Wisconsin consumers about Wisconsin origin fish and fisheries products and other seafood choices, including nutrition benefits, risks and seafood safety.
- SFA-8. Help Wisconsin wild fish harvesters and aquaculture producers promote Wisconsin fish products.
- SFA-9. Collaborate with other state agencies, education partners, and other stakeholders to develop one exhibit, lesson plan, or event on the health benefits and risks of eating Great Lakes wild-caught fish and Wisconsin farm-raised fish.
- SFA-10. Make trap net GPS locations and maps available online and at boat ramps.
- SFA-11. Collaborate with Great Lakes partners to convene semi-annual meetings to discuss Great Lakes fisheries issues.

National Sea Grant SFA Performance Measures

- SFA-npm-1. Number of fishermen, seafood processors and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities.
- SFA-npm-2. Number of seafood consumers who modify their purchases using knowledge gained in fisheries sustainability, seafood safety and the health benefits of seafood as a result of Sea Grant activities.

Wisconsin Sea Grant SFA in the Great Lakes Region Performance Measures

- SFA-wpm-1. Investment in research projects funded to support tools and techniques necessary to achieve sustainable fisheries and aquaculture production in the Great Lakes region.
- SFA-wpm-2. Number of aquaculture industry owner/operators and seafood processors using practices and knowledge as a result of Wisconsin Sea Grant activities.
- SFA-wpm-3. Increased investment in, employment by and production of aquaculture facilities as a result of Wisconsin Sea Grant activities.
- SFA-wpm-4. Trap net location maps are used by anglers.
- SFA-wpm-5. The Lake Michigan Fisheries Forum educates sport and commercial fishermen through seminars and discussion.
- SFA-wpm-6. Collaborate with other state agencies and education partners to develop exhibits or lesson plans on the health benefits and risks of eating Great Lakes wild-caught fish and Wisconsin farm-raised fish.

Focus Area: Resilient Great Lakes Communities and Economies (RCE)¹⁰

Coastal communities provide vital economic, social and recreational opportunities for millions of people within the Great Lakes basin. A 2011 study completed by the University of Michigan reported that more than 1.5 million jobs, generating \$62 billion in wages are tied to the inland seas. The job breakdown is: 994,879 in manufacturing; 217,635 in tourism; 118,550 in shipping; 118,430 in agriculture, fishing and food production; 38,085 in science and engineering; 10,980 in utilities; and 10,003 in mining. In Wisconsin, 173,969 jobs can be linked to the Great Lakes. Population migration has also transformed many natural coastal habitats into urban landscapes and intensified the use of finite coastal resources. From 2000 to 2010, the population in the 15 counties bordering Wisconsin's Great Lakes grew by 57,500. This population increase and developmental pressure has resulted in greater vulnerability of coastal communities and environments to natural¹¹ and technological¹² hazards. To accommodate more people and activity while balancing demands on coastal resources, Wisconsin must develop innovative policies, institutional capacities and management approaches to increase community resilience.

Sea Grant will continue to support cutting-edge research in the areas of marine-related energy sources, climate change, coastal processes, energy efficiency, hazards, stormwater management and tourism. In Wisconsin, Sea Grant will engage our diverse and growing coastal populations in applying the best-available scientific knowledge to address increased resource demands and vulnerability. Ultimately, Wisconsin Sea Grant will bring its unique research and engagement capabilities to support the development of resilient coastal communities that sustain diverse and vibrant economies, effectively respond to and mitigate natural and technological hazards and function within the limits of their ecosystems.

¹⁰ Resilience is determined by the degree to which a community is capable of organizing itself to increase its capacity for learning from past economic, natural or technological disasters.

¹¹ Natural hazards include hurricanes, Northeasters, tropical storms, extreme rainfall events, flooding, wildfires, tornadoes, droughts, tsunamis, blizzards and heat waves.

¹² Technological hazards include chemical and oil spills and nuclear reactor accidents.

6. Goal: Development of vibrant and resilient coastal economies.

Learning Outcomes

- 6.1. Great Lakes communities¹³ are aware of the interdependence between the health of the economy and the health of the natural and cultural systems.
- 6.2. Communities have access to information needed to understand the value of waterfront- and tourism-related economic activities.
- 6.3. Communities understand the strengths and weaknesses of alternative development scenarios on resource consumption and local economies.
- 6.4. Communities are aware of regulatory regimes affecting economic sustainability.
- 6.5. Communities are knowledgeable about economic savings from energy planning and conservation.

Action Outcomes

- 6.6. Citizens in Great Lakes communities are actively engaged in management and regulatory decisions.
- 6.7. Communities engage in economic development initiatives that capitalize on the value of their natural and cultural resources while balancing resource conservation and economic growth.

Consequence Outcomes

- 6.8. Communities have diverse, healthy economies and industries without displacing traditional working waterfronts¹⁴.

Wisconsin Sea Grant's Goal 6 Strategies

- RCE-1. Support research that seeks to document the socioeconomic values of open water and coastal tourism and related businesses, other water-dependent industries and support research that addresses natural resource valuation in the Great Lakes region.
- RCE-2. Utilize Web-based technologies, publications, displays, and communication dissemination using traditional and new media to make available, and distribute information, about the value of waterfront, tourism-related economic activities and other socio-economic impacts.
- RCE-3. Develop and use visualizations and other technology to help communities understand the resource and environmental impacts of alternative development scenarios.
- RCE-4. Collaborate with local, state, tribal and regional agencies and non-governmental organizations to implement strategies.

¹³ Communities are defined broadly to include governments, businesses, residents, visitors and non-governmental organizations.

¹⁴ Working waterfront is a term broadly used in this plan to include water-dependent and water-related industries, such as energy production, tourism, ports and harbors, marine transportation, shipyards, marinas, commercial fishing, recreational fishing, aquaculture, fishing piers and public access.

7. Goal: Communities use comprehensive planning to make informed strategic decisions.

Learning Outcomes

- 7.1. Great Lakes communities understand the connection between planning and natural resource management issues and make management decisions that minimize conflicts, improve resource conservation efforts and identify potential opportunities.

Action Outcomes

- 7.2. Great Lakes communities make use of tools and information to explore the different patterns of coastal development, including community visioning exercises, resource inventories and coastal planning.
- 7.3. Great Lakes communities adopt coastal plans.
- 7.4. The public, leaders and businesses work together to implement plans for the future and to balance multiple uses of coastal areas.
- 7.5. Property owners, governments, and coastal development interests work from a common information base about coastal hazards.

Consequence Outcomes

- 7.6. Quality of life in communities, as measured by economic and social well-being, improves without adversely affecting environmental conditions.

Wisconsin Sea Grant's Goal 7 Strategies

- RCE-5. Support research that will develop or enhance community planning and visualization tools that demonstrate the benefits, risks and consequences of urbanization on the coastal environment.
- RCE-6. Support research that assesses the economic and social well-being of Wisconsin coastal communities to document improvements in quality of life related to coastal development plan implementation.
- RCE-7. Work with Wisconsin's coastal communities, community leaders and businesses to help them develop and adopt plans for responsible development.

8. Goal: Improvements in Great Lakes coastal water resources sustain human health and ecosystem services.

Learning Outcomes

- 8.1. Great Lakes communities are aware of the impact of human activities on water quality and supply.
- 8.2. Great Lakes communities understand the value of clean water, adequate supplies and healthy watersheds.
- 8.3. Great Lakes communities understand water laws and policies affecting the use and allocation of water resources.

Action Outcomes

- 8.4. Great Lakes communities engage in planning efforts to protect water supplies and improve water quality.
- 8.5. Great Lakes communities adopt mitigation measures, best management practices and improved site designs in local policies and ordinances to address water supplies and water quality.

Consequence Outcomes

- 8.6. Great Lakes community water supplies are sustained.
- 8.7. Great Lakes water quality improves.

Wisconsin Sea Grant's Goal 8 Strategies

- RCE-8. Support research that seeks to assess the impacts of human activities on Great Lakes watersheds, water quality and supply.
- RCE-9. Communicate through presentations, visual aids, publications and web-based media alternative actions to conserve water, protect water quality and protect water supply.
- RCE-10. Help communities understand the reasons and restrictions on Great Lakes water use particularly in areas peripheral to the Great Lakes basin.

9. Goal: Resilient coastal communities adapt to the impacts of hazards and climate change.

Learning Outcomes

- 9.1. Residents and decision-makers in the Great Lakes region are aware of and understand the processes that produce hazards and climate change and the implications of those processes for them and their communities.
- 9.2. Decision-makers are aware of existing and available hazard- and climate-related data and resources and have access to information and skills to assess local risk vulnerability.
- 9.3. Communities have access to data and innovative and adaptive tools and techniques to minimize the potential negative impact from hazards.
- 9.4. Decision-makers understand the legal and regulatory regimes affecting adaptation to climate change, including coastal and riparian property rights, disaster relief and insurance issues.

Action Outcomes

- 9.5. Great Lakes coastal communities apply best available hazards and climate change information, tools and technologies in the planning process.
- 9.6. Decision-makers apply data, guidance, policies and regulations to hazard planning and recovery efforts.
- 9.7. Communities develop and adopt comprehensive hazard mitigation and adaptation strategies suited to local needs.

- 9.8. Residents take action to reduce the impact of coastal hazards on their life and property.
- 9.9. Communities adopt a comprehensive risk communications strategy for hazardous events.

Consequence Outcomes

- 9.10. Communities effectively prepare hazardous events and climate change.
- 9.11. Communities are resilient and experience minimum disruption to life and economy following hazard events.

Wisconsin Sea Grant's Goal 9 Strategies

- RCE-11. Support research that evaluates the impacts of increased climate variability and change, including intensity and frequency of rainfall and storm events on coastal community infrastructure.
- RCE-12. Develop visualization tools and make them available to communities so that they can understand the consequences of alternative development and storm-water mitigation scenarios.
- RCE-13. Collaboratively work with regulatory agencies, tribal entities and communities to help them understand the vulnerability of coastal properties to storm impacts.
- RCE-14. Make communities aware of products and tools that can help them adapt to changing coastal storm and climatic conditions.

National Sea Grant RCE Performance Measures

- RCE-npm-1. Number of communities that implemented sustainable economic and environmental development practices and policies (e.g., land-use planning, working waterfronts, energy efficiency, climate change planning, smart growth measures, green infrastructure) as a result of Sea Grant activities.
- RCE-npm-2. Number of communities that implemented hazard resiliency practices to prepare for, respond to or minimize coastal hazardous events as a result of Sea Grant activities.

Wisconsin Sea Grant's RCE Performance Measures

- RCE-wpm-1. Investment in research projects supported that seek to investigate or enhance Wisconsin's resilient coastal communities and economies.
- RCE-wpm-2. The number of new communities (of place or practice) that establish a relationship with Wisconsin Sea Grant.
- RCE-wpm-3. The number of Wisconsin coastal communities that utilize planning support tools as a result of training and technical assistance by UW Sea Grant and its partners.
- RCE-wpm-4. The number of Wisconsin Coastal Atlas-based water-resource-management tools used by Great Lakes coastal communities.

- RCE-wpm-5. The number of training sessions for coastal hazards decision-support tools conducted by Sea Grant staff and partners; the number of decision-support tools that are used to promote resilience to Great Lakes coastal hazards.
- RCE-wpm-6. The number of Wisconsin Sea Grant partners that as a result of Wisconsin Sea Grant research and outreach, design, modify an initial design, permit and/or provide grant assistance to a project.
- RCE-wpm-7. The number of Great Lakes coastline erosion control, shoreline bluff stabilization or ports and harbor infrastructure projects that are completed utilizing significant Wisconsin Sea Grant Institute coastal engineering research results, outreach and/or design assistance.

Focus Area: Environmental Literacy and Workforce Development in the Great Lakes Region (ELWD)

Wisconsin provides a crucible to meet the literacy-building and workforce development demands posed by a state, region and nation transitioning to a new era of sustainability and job creation.

We will build on a renowned K-12 public education system that consistently produces students who, taken together, best the national average ACT composite score, and rank among the top three states in well-performing students. Wisconsin also has a wealth of institutions of higher learning—33 public and private four-year colleges and 29 two-year colleges. Included in that group is the University of Wisconsin-Madison, one of the top five research schools in the country. The school also holds, as a critical tenet, the Wisconsin Idea. The Wisconsin Idea is a public-service concept that the boundaries of the university extend to the boundaries of the state and beyond. This principle is also the heart of Wisconsin Sea Grant’s efforts.

Building a workforce literate in science, technology, engineering and mathematics is crucial to maintaining America’s competitiveness in a rapidly changing global economy. These skills are also necessary to advance cutting-edge research and to promote enhanced resource management. In recognition of these needs, the America COMPETES Act¹⁵ mandates that NOAA build on its historic role in stimulating excellence in the advancement of ocean and atmospheric science and engineering disciplines. The Act also mandates that NOAA provide opportunities and incentives for the pursuit of academic studies in science, technology, engineering and mathematics. Workforce needs are reflected in the broader science and technology communities of both the private and public sectors with whom Sea Grant works to fulfill its mission.

An environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and utilize scientific evidence to make

¹⁵ America COMPETES, 2010: <http://www.commerce.gov/americancompetes>

informed decisions regarding environmental issues¹⁶. Once again, Wisconsin is a crucible for these concepts. It is the home state and the epicenter of much of the research, writing and innovation of such environmental giants as John Muir, Aldo Leopold and Sen. Gaylord Nelson, the founder of Earth Day. Wisconsin Sea Grant carries on the traditions of its environmental forebears when providing stakeholders with the decision-making tools to synthesize economic, aesthetic, cultural and ethical values.

10. Goal: An environmentally literate public supported and informed by a continuum of lifelong formal and informal engagement opportunities.

Learning Outcomes

- 10.1. Formal and informal educators in the Great Lakes region are knowledgeable of the best available science on the effectiveness of environmental science education.
- 10.2. Formal and informal educators understand environmental literacy principles.
- 10.3. Lifelong learners are able to engage in informal science education opportunities focused on coastal topics.

Action Outcomes

- 10.4. Engagement professionals in the Great Lakes region use environmental literacy principles in their programs.
- 10.5. Engagement programs are developed and refined using the best available research on the effectiveness of environmental and science education.
- 10.6. Formal and informal education programs incorporate environmental literacy components.
- 10.7. Formal and informal education programs take advantage of the knowledge of Sea Grant-supported scientists and engagement professionals.
- 10.8. Formal and informal educators, students and/or the public collect and use coastal weather data in inquiry and evidence-based activities.
- 10.9. Lifelong learners make choices and decisions based on information they learned through informal science education opportunities.
- 10.10. Educators work cooperatively to leverage federal, state and local investments in coastal environmental education.

Consequence Outcomes

- 10.11. Members of the public incorporate broad understandings of their actions on the environment into personal decisions.

Wisconsin Sea Grant's Goal 10 Strategies

- ELWD-1. Work with education partners to develop K-12 curricula that address the Great Lakes Literacy Principles and adhere to science and environmental education standards approved by the Wisconsin Department of Public Instruction.

¹⁶ 2009-2029 NOAA Education Strategic Plan

- ELWD-2. Engage Sea Grant-supported graduate students, scientists and informal educators to help develop educational demonstrations for Great Lakes issues and topics to promote Great Lakes literacy.
- ELWD-3. Engage NOAA National Weather Service staff, NOAA Cooperative Institutes and NOAA regional research laboratories in education and outreach activities.
- ELWD-4. Engage the public and lifelong learners through a Great Lakes seminar series that draws upon the expertise of Sea Grant and agency researchers and outreach specialists.
- ELWD-5. Participate in or help sponsor informal education events throughout the state that support Great Lakes literacy.
- ELWD-6. Assess the applicability of new and traditional media tools—as well as innovative learning tools such as virtual globes or Augmented Reality Interactive Storytelling (ARIS) platforms—to reach relevant audiences, and apply those tools to build marine-science literacy.

11. Goal: A future workforce reflecting the diversity of Sea Grant programs, skilled in science, technology, engineering, mathematics and other disciplines critical to local, regional and national needs.

Learning Outcomes

- 11.1. Students and teachers in the Great Lakes region are aware of opportunities to participate in science, technology, engineering, mathematics and active stewardship programs.

Action Outcomes

- 11.2. A diverse and qualified pool of applicants pursues professional opportunities for career development in natural, physical and social sciences and engineering.
- 11.3. Graduate students are trained in research and engagement methodologies.
- 11.4. Research projects support undergraduate and graduate training in fields related to understanding and managing our coastal resources.

Consequence Outcomes

- 11.5. A diverse workforce trained in science, technology, engineering, mathematics, law, policy or other job related fields is employed and have high job satisfaction.

Wisconsin Sea Grant’s Goal 11 Strategies

- ELWD-7. Establish a Wisconsin Sea Grant graduate student fellows program to help make Sea Grant-supported graduate students aware of the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- ELWD-8. Support research projects that engage and train graduate and undergraduate students about Great Lakes coastal resources.

- ELWD-9. Foster cooperative relationships with Wisconsin museums, nature centers and schools to help make students and teachers aware of science, technology, engineering and mathematics (STEM) activities and coastal stewardship programs.
- ELWD-10. Collaborate with local, state, tribal and regional agencies and non-governmental organizations to implement strategies.

National Sea Grant ELWD Performance Measures

- ELWD-npm-1. Number of Sea Grant facilitated curricula adopted by formal and informal educators.
- ELWD-npm-2. Number of people engaged in Sea Grant supported informal education programs.
- ELWD-npm-3. Number of Sea Grant-supported graduates who become employed in a career related to their degree within two years of graduation.

Wisconsin Sea Grant Great Lakes ELWD Performance measures

- ELWD-wpm-1. Investment in education research projects that seek to improve environmental literacy or workforce development.
- ELWD-wpm-2. Number of place-based learning activities addressing Great Lakes issues utilizing virtual globes or the Augmented Reality Interactive Storytelling (ARIS) platform developed by Wisconsin Sea Grant.
- ELWD-wpm-3. The number of Wisconsin Sea Grant graduate fellows who actively participate in WISG educational outreach activities.
- ELWD-wpm-4. The number of educational products developed by Wisconsin Sea Grant PIs with WISG outreach staff to effectively communicate their research projects to Great Lakes stakeholders.
- ELWD-wpm-5. The number of people reached by Wisconsin Sea Grant informal education events.
- ELWD-wpm-6. Number of K-12 curricula to address the Great Lakes Literacy Principles that adhere to science and environmental education standards approved by the Wisconsin Department of Instruction.

CROSS-CUTTING PERFORMANCE MEASURES

- CC-pm-1. Economic (market and non-market; jobs and businesses created or retained) benefits derived from Wisconsin Sea Grant activities.
- CC-pm-2. Number of peer-reviewed publications produced as a result of Wisconsin Sea Grant support, and number of citations for all peer-reviewed publications from the last four years.

Appendix 1

Wisconsin Situation Analysis and Needs

With nearly 1,000 miles of shoreline on Lakes Michigan and Superior, Wisconsin has many Great Lakes-related issues in common with the rest of the region. All of the state's coastal communities and electric power plants draw their water from the lakes, and since 1990 hundreds of millions of dollars have been spent to prevent them from becoming clogged with zebra mussels. Preventing the spread of zebra mussels and other **aquatic invasive species** to the state's 15,000 lakes and other inland waters is a continuing concern.

Five of the 43 U.S.-Canadian International Joint Commission's severely polluted Great Lakes "Areas of Concern" (AOC) are located in Wisconsin, and the Fox River-Green Bay AOC in particular is one of the largest single sources of the PCBs, mercury, dioxin and other **toxic chemical contaminants** in Lake Michigan fish today. Toxic contaminants and invasive aquatic plants and animals are of special concern because **fishing** and **boating** are exceptionally popular activities throughout Wisconsin, where there are more than a half-million registered boats and more than 700,000 resident fishing licenses are sold annually. Wisconsin typically sells about 1.4 million fishing licenses during the regular fishing season, which ranks it fifth nationally in total number of licenses sold. About 90 percent of Wisconsin's 250 Great Lakes charter fishing boats operate on Lake Michigan, which also supports about 50 commercial fishing operations.

More than a dozen other large rivers and numerous smaller tributaries that drain rural, suburban and urban coastal watersheds also contribute significant sediment and contaminant burdens to Wisconsin waters of Lake Michigan, which adversely affect the water quality, habitat and biota of tributary and nearshore water alike. As in other coastal areas of the region and nation, **beach closings** due to bacterial contamination are a major problem, and nuisance ***Cladophora* algal blooms** in Lake Michigan are increasing as a result of high nutrient loads in watershed runoff.

About 2.5 million people—nearly half of the state's population—live in the watersheds that drain into Lakes Michigan or Superior, including several federal Indian Reservations on which many residents rely on local natural resources for their subsistence. It is likely that continued coastal development and urbanization, if not planned carefully, will have increasingly adverse effects on **water quality and habitat** both within the watersheds and in coastal waters. Recognizing that accurate land-use data is essential to "smart growth" planning, Wisconsin leads the nation in modernization of its land information system through the use of computer-based Geographic Information Systems (GIS). Ultimately, however, the restoration and protection of Great Lakes water quality and coastal habitat will require that **GIS and other geospatial data** from coastal watersheds be integrated with data obtained from *in situ* lake observation systems and remote satellite data to develop an analytical tool with predictive capability.

Wisconsin's population in 2000 was estimated at 5.4 million, more than 37 percent of whom live in the 11 counties bordering Lake Michigan and Green Bay. These coastal counties and adjacent inland counties have experienced above-average population growth for the last 20 years. The state's four most heavily urbanized and industrialized southeastern coastal counties—Kenosha, Racine, Milwaukee and Ozaukee—are home to about 25 percent of Wisconsin's population. Much of this area has experienced severe drawdowns in local groundwater supplies, creating a growing **demand for Lake Michigan water** for residential and industrial uses—a contentious issue because most of this area lies outside the Lake Michigan basin.

Erosion is a perpetual problem along the shores of these geologically young lakes, and where shoreline development takes place, property damage from **coastal erosion** is common. This erosion accelerates during times of high lake water levels, while low water levels create navigation hazards for ships and other watercraft and increase the need for dredging channels and harbors.

One of the fastest-growing segments of Wisconsin's agriculture industry is **aquaculture**. According to a recent survey by the Wisconsin Department of Agriculture, Trade and Consumer Protection, aquaculture in the state has been growing at a rate of more than 10 percent per year and now has an annual value of almost \$9 million. Wisconsin has the requisite resources and climatic conditions for culturing several marketable cold- and cool-water species of fish, including trout, salmon, whitefish, ciscoes, walleye and perch. This represents a huge potential for significant long-term economic development, not only of food fish, but baitfish and hatchery enterprises as well.

With agriculture and manufacturing, **tourism** is one of the state's top three industries—and Lake Michigan is a big part of it. Tourists from Chicago and neighboring states are drawn to Wisconsin's Lake Michigan coast, which offers an attractive selection of eight state parks, two state forests, dozens of public beaches and some 73 lake access points, many featuring marinas and boat launches.

While the population of the state's four Lake Superior coastal counties grew less than 3 percent during the 1990s, they have shown steady growth in recreation and tourism businesses directly related to the lake—particularly in the Apostle Islands National Lakeshore area—including charter boat fishing, marinas, sailboat and sea kayak rentals and instruction, and related tourist support services. The area is also home to the largest harbor on the Great Lakes, the Port of Duluth-Superior, which handles 38 million tons of bulk cargo and hosts 1,100 ships annually—and where **accelerated corrosion of steel harbor structures** could cost up to \$100 million to repair if the causes and a solution are not found soon.

As elsewhere in the U.S. and the rest of the Great Lakes region, **high and rising energy costs** are affecting the health of the Great Lakes shipping industry, commercial and charter fishing

operations, and coastal tourism, and developers are seriously contemplating the construction of wind energy farms in Lake Michigan and along its coast.

Climate change projections for this region of the world are beginning to raise a number of issues at the local and state levels. **Regional climate change** projections call for an accelerating rise in average temperatures throughout the year, leading to more frequent severe storms and greater amounts of stormwater runoff, extreme heat waves and drought in summer, and bigger snowfalls yet briefer periods of snow cover and ice cover on lakes due to shorter, warmer winters. Such projected changes in precipitation patterns, runoff and evaporation rates, and their effects on groundwater recharge have significant implications for Great Lakes and coastal resources, including shipping and port facilities, municipal sewerage and stormwater systems, and drinking water supplies as well as for recreational and commercial fishing, tourism and numerous other coastal industries.

Wisconsin's universities and colleges are a vital force in meeting the challenges of these Great Lakes issues. The University of Wisconsin-Madison offers unique research strengths with its internationally recognized Center for Limnology and its Environmental Chemistry and Technology Program. The UW-Madison Biotechnology Center coordinates a multidisciplinary research program involving more than 50 campus units. The UW-Milwaukee Aquaculture Institute and School of Freshwater Sciences provide the Wisconsin Sea Grant program with leaders in aquaculture and estuarine and coastal processes research. Well-developed natural resources research, extension and education programs at UW-Stevens Point, UW-Green Bay, UW-La Crosse, Lawrence University, Marquette University and other Wisconsin campuses add to the wealth of the state's academic talent and capabilities.

The high-quality applied and basic research, education and outreach projects funded by the UW Sea Grant College Program via a highly competitive grants process help provide the scientific knowledge necessary for addressing the full range of Great Lakes resource issues.

Appendix 2

Great Lakes Regional Research Information Network (GLRRIN)

GLRRIN was created in 2006 and is a voluntary network of 23 U.S. and Canadian governmental, academic and private programs involved in Great Lakes research. Participants include Wisconsin Sea Grant and five other Great Lakes state Sea Grant programs, NOAA's Great Lakes Environmental Research Laboratory, the International Joint Commission, Great Lakes Commission, Great Lakes Fishery Commission, U.S. Environmental Protection Agency-Great Lakes National Program Office, U.S. Fish & Wildlife Service-Great Lakes/Big Rivers Region, U.S. Army Corps of Engineers-Detroit District, U.S. Geological Survey-Great Lakes Science Center, three Canadian agencies and two Canadian universities.

GLRRIN's goal is to develop a comprehensive regional research and information plan designed to focus research, technology transfer and outreach efforts on the highest priority issues for each of the five Great Lakes. To that end, it has created five coordination teams composed of individuals from the above organizations to identify the research and information needs for each of the Great Lakes.

Members of GLRRIN's original Lake Michigan Coordination Team included Wisconsin Sea Grant Director Anders Andren; Phil Mankin, interim associate director and research coordinator for Illinois-Indiana Sea Grant; Stephen Brandt, director of NOAA's Great Lakes Environmental Research Laboratory, and Paul Horvatin, director of the U.S. EPA Great Lakes National Program Office.

In 2007, the Lake Michigan Coordination Team conducted a survey of nearly 300 organizations with a strong interest in lake issues. **Invasive species** ranked among the top five issues identified from a total of 379 priorities submitted by 52 organizations. The other top-five priority areas were **ecosystems**, **pollutants**, **education** and **water quality** issues. The Lake Michigan has compiled a Scientific Resources Database that will provide an online listing of people collecting data on Lake Michigan and their areas of interest (<http://www.glrrin.info/>). These GLRRIN priorities for Lake Michigan have been woven into Wisconsin Sea Grant's strategic plan and will be among the priorities listed in UW Sea Grant's Request for Proposals.

Appendix 3

University of Wisconsin – Madison Strategic Priorities and Initiatives 2009-2014

Provide an exemplary undergraduate education

- Improve access by significantly increasing need-based financial aid
- Increase enrollment in high-demand and high-capacity areas, contingent on new revenue
- Transform curriculum to reflect changes in research and scholarship, and reward departments and interdisciplinary programs that make significant changes
- Integrate technology into the delivery of course content
- Improve the quality of undergraduate teaching among faculty, staff, and graduate students
- Increase the number of tenure-track and tenured faculty positions in the liberal arts to avoid caps on popular majors, and make more faculty available to teach undergraduate courses, contingent on increased revenue
- Integrate students classroom and out of-classroom experiences, with emphasis on internships, field-based and service learning, entrepreneurship, capstone experiences, and study abroad
- Promote service and civic responsibility
- Create the physical space and technology infrastructure to support enhanced teaching and learning

Reinvigorate the Wisconsin Idea and renew our commitment to our public mission

- Improve communications, and build vibrant and mutually beneficial relationships with government officials, community and state business leaders, educators, and the broader public
- Focus and highlight our efforts in areas where public problems and university strengths overlap, such as alternative energy sources, environmental protection and policy, public health, K12 education, internationalization, governance, and cultural production
- Educate more students in fields that are critical to the state, such as engineering and nursing
- Enhance the speed with which we transfer knowledge and technology to promote economic development
- Support the efforts of faculty and staff to establish productive collaborations across the university, the state, and the world

Invest in scholarly domains in which we have existing or potential strength and impact

- Continue to invest in interdisciplinary life sciences and biotechnology, including the scientific and engineering disciplines that support 21st-century biology, and the humanities and social sciences that analyze and influence its effects
- Reinvest in the liberal arts, with special efforts to publicize the importance of the humanities
- Ensure strength in the core disciplines, while promoting innovation, interdisciplinary connections, and reorganization of disciplines, where it makes intellectual sense to do so
- Improve our research infrastructure, including pre- and post-award management and compliance
- Increase funding and support for graduate students

Recruit and retain the best faculty and staff, and reward merit

- Make progress toward our goal of reaching the median of our peer group in faculty salaries, as well as relevant market medians for staff
- Use recruitment and retention funds strategically to support existing or emerging areas of strength and innovation
- Promote the passage of domestic-partner benefits
- Enhance department cultures and hiring practices to ensure diversity
- Continue to foster a vibrant intellectual community
- Develop the skills and creativity of our faculty and staff

Enhance diversity in order to ensure excellence in education and research

- Prepare our students for a world that is diverse, global, and interconnected
- Promote the appreciation of human differences
- Step up efforts to recruit and retain underrepresented students, faculty, and staff
- Establish new forms of accountability for efforts to increase diversity
- Build an open, dynamic, and respectful learning and working environment for all members of our community
- Align our diversity, equity, and inclusion efforts across our different campus units

Be responsible stewards of our resources

- Align resources with priorities
- Make our administration and governance more effective, efficient, and flexible
- Identify and pursue new revenue sources
- Promote environmental sustainability on and off campus
- Improve our technology infrastructure
- Assess our progress and make our assessments available to the campus

Appendix 4

Our Strategic Planning Process

First and foremost, Wisconsin Sea Grant's 2014-17 Strategic Plan is structured in accordance with the National Sea Grant College Program 2014-17 Strategic Plan. The national Sea Grant strategic plan provides a guide for the work of the state Sea Grant programs. Each university program then develops its own strategic plan for contributing to the realization of national goals, while reflecting the specific needs and priorities of its state and region.

The UW Sea Grant strategic plan also addresses the institutional goals and priorities of the University of Wisconsin-Madison's priorities and initiatives. By combining the strategic goals and priorities of the National Sea Grant network with those of our parent institution, our strategic plan thus provides a highly relevant basic blueprint for UW Sea Grant research, outreach, education and program administration.

Built on this foundation, our strategic planning process is a bottom-up process in which our program priorities undergo review and updates every two years in connection with preparing our biennial Request for Proposals, and the entire plan is reviewed and updated every four years in connection with developing the program's core Advisory Services, Communications and Education work plans for the next four years.

This process begins with a review of our existing plan by our Advisory Committee on Outreach and Education. This is followed by a needs assessment conducted by our six Advisory Services specialists, who serve as the primary mechanism for identifying the research, outreach and education needs of local resource managers, users and other constituent groups, which are then communicated to program managers. The specialists survey the constituents of their respective coastal service areas for new or emerging priorities in each focus area and also take into account the strategic priorities of various local, state, regional and federal Great Lakes resource managers with whom they work. Program priorities are also developed through conference calls and meetings with key user groups as well as forums and workshops with other stakeholders.

The 2010-2014 strategic plan was circulated for comment to a distribution list of more than 900 individuals statewide, including representatives of local, state and regional constituent groups; city, county, state and federal government officials; past and present UW Sea Grant principal investigators, and research scientists and research administrators at public and private colleges and universities throughout the state. It is also posted on the UW Sea Grant website for public comment. The Web URL was printed twice in two major coastal newspapers inviting comment by readers. The Sea Grant quarterly newsletter, which reaches more than 3,000 subscribers, also included an appeal for comment. All comments received are compiled and reviewed by program management, after which the Wisconsin priorities under each focus area are revised to incorporate suggested deletions, revisions and additions.

The draft 2014-2017 plan is then presented to the UW Sea Grant Advisory Council and Advisory Committee on Outreach and Education for their review and approval. Representing other units

of the UW System, state and local government, industry, and the public, these two advisory bodies represent a wide range of viewpoints and help ensure the program's accountability to faculty, staff and constituents statewide. These advisory bodies, along with UW Sea Grant staff, are also actively involved in helping program managers identify special research opportunities and new research talent.

Although our strategic plan is built with a three-year horizon, near-term priorities are regularly adjusted based on the continual feedback and input we receive from our many constituents both directly and via our advisory bodies and outreach specialists in aquaculture, aquatic invasive species, coastal engineering, marine and aquatic science education, fisheries, geographic information systems, habitat restoration, water quality and social science.

Revised and updated in this manner on a continuing basis, the UW Sea Grant Institute strategic plan is thus a working document that is constantly evolving. This keeps the Wisconsin Sea Grant program flexible, innovative and responsive, enabling it to adapt relatively quickly to meet changing situations and take advantage of new opportunities. This continual strategic planning process helps guarantee that UW Sea Grant is national issues-oriented, constituent priorities-driven and fully integrated program that serves the goals and priorities of our state, university and nation.